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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,870	HEIKKILA ET AL.	
	Examiner	Art Unit	
	SUSAN HANLEY	1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40,45,48-50,55-57,60-77,80 and 81* is/are pending in the application.

4a) Of the above claim(s) *62-69,72-77,80 and 81* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40,45,48-50,55-57,60,61,70 and 71* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-40, 45, 48-50, 55-57, 60-77, 80 and 81 are pending.

Election/Restrictions

Applicants' election with traverse of Group I, claims 1-61, 70 and 71, that the optional step of neutralization is not performed and that the source of the vegetable rich fiber is exudate gum wherein the gum is arabic species in the reply filed on 11/23/09 is again acknowledged. The specie elections were withdrawn.

Claims 62-69, 72-77, 80 and 81 stand withdrawn.

Claims 1-40, 45, 48-50, 55-57, 60, 61, 70 and 71 are under examination.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The response and amendment filed 6/29/2009 are acknowledged. The rejections not explicitly restated below are withdrawn due to Applicant's response in the amendment filed 6/29/2009. The following rejections and/or objections are either reiterated or newly applied. They constitute the complete set presently being applied to the instant application.

Claim Suggestion

It is suggested that claims 34-38 be written is the active voice.

Response to Arguments

Claim 70 remains objected to because it fails to further limit claim 1.

Applicants argue that a dependent claim must only further limit the scope of a claim from which it depends and that claim 70 further limits claim 1 since it further produces one other monosaccharide.

Applicant's argument has been considered but it is not persuasive. The scope of claim 1 is to produce arabinose and optionally at least one other monosaccharide selected from the group consisting of galactose, rhamnose and mannose. Epimerization of the produced arabinose fails to limit the intended scope for producing arabinose and claim one does not recite that ribose is one of the other sugars produce from the vegetable fiber.

New Grounds of Rejection

Claim Rejections - 35 USC § 112

Claims 1-40, 45, 48-50, 55-57, 60, 61, 70 and 71 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is rejected because the Markush group members are not options. In the interest of clarity it is suggested that lines 10-11 be changed to the following: "group consisting of galactose, rhamnose and mannose; and optionally further containing poly-, oligo- and/or disaccharides, soluble polymers and undissolved solids". It is further suggested that "content" be placed after each recitation of "DS".

Claim 70 is rejected because it is inconsistent with the preamble of claim 1. The method of claim 1 is for recovering arabinose from a vegetable fiber while the method of

claim 70 is drawn to epimerizing arabinose to make ribose. Thus, claim 70 is drawn to a different method as compared to the stated purpose of claim 1.

Claims 2-40, 45, 48-50, 55-57, 60, 61 and 71 are rejected because they are dependent claims that do not overcome the deficiencies of the rejected independent claim from which they depend.

Claim Rejections - 35 USC § 103

Claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingle et al. (1985, cited in the last Office action) in view of Heikkila et al. (US 20020120135) and Antila et al. (US 6,506,897; cited in the last Office action).

Ingle discloses the preparation of L-arabinose (instant claim 71) from gum ghatti (instant claims 4 and 5) by acidic hydrolysis with 0.3 % sulfuric acid (instant claims 1(a), 17 and 18), neutralizing the hydrolysate (claim 1(b)); filtering the hydrolyzed arabinose to remove bark (instant claim 1(c), rectifying the filtrate and crystallizing the recovered hydrozylate (instant claim 1(e); in part); and washing the crystals with ethanol (claim 50; pages 370,right col. to 371 (left col., first para). Ingle teaches a slight impurity of galactose along with the crystallized arabinose (p. 371, left col., third para.; instant claims). Gum ghatti contains at least galactose, arabinose and xylose (p. 370, left col. 2nd paragraph). Hence, the ordinary artisan would have a reasonable expectation that the hydrolysis mixture would contain these monosaccharides since the bonds between these sugars must be broken down to release the arabinose.

Ingle is silent regarding the content of the arabinose in the gum (instant claims 2 and 3) and its ability to dissolve in water or alkali (claim 9) but meets the claimed limitations (the arabinose-containing substance is gum ghatti) which indicates that the claimed characteristics should be present in the prior art invention as also as those instantly claimed. In this case, burden is shifted to the Applicant to distinguish the instant invention over the prior art. It is noted that In re Best (195 USPQ 430) and In re Fitzgerald (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not possess characteristic relied on" (205 USPQ 594, second column, first full paragraph). Ingle does not teach that the crystallized arabinose was recrystallized (claim 49). Ingle does not teach that there is galactose as an impurity in the obtained filtrate. In absence of evidence to the contrary, the filtrate containing arabinose is free of galactose (claim 48).

The limitation of claims 1 (d), 20-29, 33-38 and 40 are met since they are optional steps that are not practiced. Claim 38 is interpreted to be an optional step since it is tied to step 1(d) which is an optional step.

Ingle does not teach the method of crystallization of the clarified hydrolysate as recited in steps 1((e) and 39) or the conditions of time, pH and temperature of the hydrolysis (claim 19).

Heikkila et al. disclose a method for crystallizing arabinose by boiling a feed stream containing arabinose in a boiling crystallizer. The boiled liquid was seeded and continued boiling. The boiling mass was then moved to a cooling crystallizer to obtain arabinose crystals.

Heikkila et al. do not explicitly teach that the added crystal seeds were of arabinose but the ordinary artisan would have been motivated to add crystal seeds of arabinose since that it what is being crystallized. The ordinary artisan would have had a reasonable expectation that one could seed a liquid mixture of arabinose with arabinose crystals to obtain the desired crop of crystals since the seeded crystals provide a nucleation site for crystallization of the arabinose in the liquid.

Antila et al. teach that arabinose can be crystallized from water (col. 1, line 41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to crystallize the clarified aqueous hydrolysate of Ingle et al. by the method of Heikkila et al. The ordinary artisan would have been motivated to do so because since Heikkila et al. teaches that a feed stream containing arabinose can be easily crystallized, the ordinary artisan would have realized that the rectification step of Ingle et al. could be eliminated to directly obtain crystals. The ordinary artisan would have had a reasonable expectation that one could crystallize arabinose from an aqueous solution since Antila et al. teach this.

While the references listed above do not specifically teach the limitations of carrying out the acidic hydrolysis of the arabinose-containing material of Ingle at al. at a temperature of 70 to 140 degrees at a pH of 0.7 to 2.5 for 0.4 to 6 hours as seen in

claim 19, and adjustment of the conditions to reduce the amount of galactose in the hydrolysate one of ordinary skill in the art would recognize time, pH and temperature of heating as results effective variables dependant on the desired degree of hydrolysis of the raw material to produce mainly the desired product, arabinose. This is motivation for someone of ordinary skill in the art to practice or test the parameter values widely to find those that are functional or optimal which then would be inclusive or cover that values as instantly claimed. Absent any teaching of criticality by the Applicant concerning the time and temperature of the hydrolysis, it would be prima facie obvious that one of ordinary skill in the art would recognize these limitations are result effective variable which can be met as a matter of routine optimization (MPEP § 2144.05 II).

The combined references do not teach the yields of or the degree of purity of the arabinose from the various steps of the process (claims 10-13, 15, 16, 33, 45, 55-57, 60 and 61). However, said yields and degrees of purity would naturally follow from the method of the combined references because they teach the claimed steps.

Claims 1-5, 9-30, 33-40, 45, 48-50, 55-57, 60, 61 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingle et al. (1985) Heikkila et al. (US 20020120135; hereafter Heikkila '135) and Antila et al. (US 6,506,897), as applied to claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71 in further view of Heikkila et al. (US 2002/0153317; Heikkila ‘317; cited in the IDS filed 7/28/06).

The combined disclosure by Ingle, Heikkila ;135 and Antila et al. is discussed supra.

The combined disclosures do not teach that the arabinose in the clarified hydrolysate is achieved by nanofiltration.

Heikkila '317 discloses that arabinose can be recovered from a mixture by nanofiltration (section [0103]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the filtration process of the combined references by nanofiltration. The ordinary artisan would have been motivated to do so because Heikkila teaches that it is effective to remove contaminants. The ordinary artisan would have had a reasonable expectation that one could subject a solution containing arabinose to nanofiltration to remove contaminants since Heikkila teaches that the method is effective to remove even the smallest of sugars including disaccharides.

Claims 1-5, 7-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingle et al. (1985) Heikkila et al. (US 20020120135) and Antila et al. (US 6,506,897), as applied to claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71, in further view of Kramar et al. (CS 181484; CAPLUS abstract only).

The combined disclosures by Ingle et al., Heikkila et al. and Antila et al. are discussed supra.

The combined disclosures do not teach that the source of the arabinose-containing material is birch bark (claims 7 and 8).

Kramar et al. disclose that arabinose and xylose can be obtained by the acidic hydrolysis (sulfuric acid) of birch bark.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ birch bark for the ghatti gum as the source of arabinose as disclosed by the combined references. The ordinary artisan would have been motivated to do so because it contains arabinose which is obtainable by acidic hydrolysis (as in the method of the combined disclosures). The ordinary artisan would have had a reasonable expectation that one could obtain arabinose from birch bark by acidic hydrolysis since Kramar et al. teach this.

Claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingle et al. (1985) Heikkila et al. (US 20020120135) and Antila et al. (US 6,506,897), in further view of Tanaka et al. (US 20030040489).

The combined disclosures by Ingle, Heikkila et al. and Antila et al. are discussed supra.

The combined disclosures not teach that the hydrolysis is carried out by enzymes (instant claim 1).

Tanaka et al. disclose a method for producing L-arabinose (instant claim 71) by treating a natural material containing arabinose, arbinoxylan or arabinogalactan with an enzyme having actiivty that hydrolysis said sources of arabinose (abstract). The

produce thus obtained may be purified by various chromatographic means including ion exchange (section [0038]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the hydrolysis of the ghatti gum taught by the combined disclosures by enzymes. The ordinary artisan would have been motivated to do so because each method is known to have the same function (hydrolysis of a substance that contains arabinose to yield L-arabinose). Hence, the substitution of the enzymatic method for the acidic hydrolysis procedure is no more than the predictable use of prior art elements according to their established functions resulting in the simple substitution of one known element for another for a predictable result. The ordinary artisan would have had a reasonable expectation that one could successfully enzymatically hydrolyze gum ghatti to L-arabinose because Tanaka et al. teach the successful accomplishment of this objective with arabinose-containing substances that also contain xylose and galactose.

Claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61, 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingle et al. (1985) Heikkila et al. (US 20020120135) and Antila et al. (US 6,506,897), as applied to claims 1-5, 9-29, 33-40, 45, 48-50, 55-57, 60, 61 and 71, in further view of Dobler et al. (US 4,778,531).

The combined disclosures by Ingle, Heikkila et al. and Antila et al. are discussed supra. Ingle et al. further teach that rare sugars such a D-ribose can be prepared from L-arabinose (p. 369, left col., third paragraph).

The combined disclosures not teach the preparation of D-ribose from L-arabinose.

Dobler et al. teaches that D-ribose is prepared from L-arabinose by epimerization of L-arabinose in the presence of a molybdenum catalyst (col. 1, lines 37-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to convert the L-arabinose obtained by the combined references to D-ribose. The ordinary artisan would have been motivated to do so because Ingle teaches that L-arabinose is a source of D-ribose. The ordinary artisan would have had a reasonable expectation that one could epimerize L-arabinose to view of evidence from Ullmann's D-ribose since Dobler et al. teach this process.

Claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135) in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010).

Antila discloses the recovery of L-arabinose (instant claim 71) by the basic extraction of sugar beet (instant claims 6 and 9), hydrolysis with an acid (step 1(a)), neutralization (step 1(b)), filtration to remove gypsum (step 1(c)), followed by purification on a cationic Na^+ ionic exchange (step 1(d); col. 2, flow chart). The ion exchanger is a metal Na^+ form (e.g., sulfonated polystyrene divinyl benzene with water as eluant (col. 1, lines, 45-60. (claims 20-23; Ullmann's teaches that this type of cation exchange resin

is strongly acidic (p. 5; evidence document). In ex. 4, two fractions are collected from the ion exchange, one containing glucose, galactose and fructose; instant claims 1 and 20 (a fraction containing other monosaccharides including galactose is isolated) and an arabinose fraction (containing small amounts of galactose and fructose). Antila et al. do not teach the amount of galactose in this fraction, but in absence of evidence to the contrary it is less that 2% since Antila et al. meet the other steps of claim 1.

In Ex. 5, the hydrolysate was run on the cationic exchange col. and the eluant is concentrated to about 70% by weight and crystallized (instant claim 40). Antila et al. teach that the concentrated eluant can be seeded with crystal of arabinose (col. 3, lines 39-42). The term “comprising” is open language. Hence, the prior art can contain additional elements (extraction with base) that are encompassed by, but not specifically named, by the claims. The acid is sulfuric acid at a pH of 0.8 (col. 2, lines 56-57: instant claims 17 and 18). Antila et al. do not teach that the crystallized arabinose was recrystallized (claim 49).

Antila et al. also teach that weakly acidic cation exchange resins are effective for separating arabinose from other monosaccharides. The resins are in H^+ or Na^+ form (instant claims 24 and 25; section [0016]).

The limitation of claims 26-29 and 34-38 are met since they are optional steps that are not practiced. Claim 38 is interpreted to be an optional step since it is tied to step 1(d) which is an optional step.

Antila is silent regarding the content of the arabinose in the sugar beet pulp (instant claims 2 and 3) but meets the claimed limitations (that the vegetable fiber is

sugar beet pulp) which indicates that the claimed characteristics should be present in the prior art invention as also as those instantly claimed. In this case, burden is shifted to the Applicant to distinguish the instant invention over the prior art. It is noted that In re Best (195 USPQ 430) and In re Fitzgerald (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not possess characteristic relied on" (205 USPQ 594, second column, first full paragraph).

Antila et al. do not teach that the crystallization is carried out by the method of step 1(e) on the eluant of arabinose containing a small amount of galactose and fructose in Ex. 4) or that the purification on the ion exchange is accomplished by a weakly acidic cation exchange resin.

The disclosure by Heikkila et al. is discussed supra.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the crystallization on the fraction containing the arabinose in Ex. 4. The ordinary artisan would have been motivated to do so because the fraction contains arabinose, the desired product. The ordinary artisan would have had a reasonable expectation that one could crystallize arabinose from this fraction since it contains arabinose.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to crystallize the aqueous eluant from the cationic exchange step

of Antila et al. by the method of Heikkila et al. because each method is known to have the same function, crystallizing arabinose. Hence, the substitution is no more than the predictable use of prior art elements according to their established functions resulting in the simple substitution of one known element for another for a predictable result. The ordinary artisan would have had a reasonable expectation that one could successfully use the method of Heikkila since it results in the crystallization of arabinose.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a weakly acidic cation exchange resin for the separation of arabinose from other monosaccharides. The ordinary artisan would have been motivated to do so because each process is known to have the same function, separating arabinose from other monosaccharides. Hence, the substitution is no more than the predictable use of prior art elements according to their established functions resulting in the simple substitution of one known element for another for a predictable result. The ordinary artisan would have had a reasonable expectation that one could successfully purify arabinose from other monosaccharides on a weakly acidic cation exchange resin since Heikkila et al. teach this.

While the references listed above do not specifically teach the limitations of carrying out the acidic hydrolysis of the arabinose-containing material of the combined references at a temperature of 70 to 140 degrees at a pH of 0.7 to 2.5 for 0.4 to 6 hours as seen in claim 19 or adjusting the conditions to obtain as little galactose as possible, one of ordinary skill in the art would recognize time, pH and temperature of heating as results effective variables dependant on the desired degree of hydrolysis to

obtain the desired product, arabinose. (It is noted that sugar beet contains other sugars that are in the eluant from the ion exchange chromatography that are removed by crystallization (col. 5, Table 2 and col. 6) is motivation for someone of ordinary skill in the art to practice or test the parameter values widely to find those that are functional or optimal which then would be inclusive or cover that values as instantly claimed. Absent any teaching of criticality by the Applicant concerning the time and temperature of the hydrolysis, it would be prima facie obvious that one of ordinary skill in the art would recognize these limitations are result effective variable which can be met as a matter of routine optimization (MPEP § 2144.05 II).

The combined references do not teach the yields of or the degree of purity of the arabinose from the various steps of the process (claims 10-13, 15, 16, 32, 33, 45, 55-57, 60 and 61). However, said yields and degrees of purity would naturally follow from the method of the combined references because they teach the claimed steps.

Regarding the publication date of the Encyclopedia, the critical date of extrinsic evidence showing a universal fact need not antedate the filing date. As discussed in MPEP § 2124:

> In certain circumstances, references cited to show a universal fact need not be available as prior art before applicant's filing date. In re Wilson, 311 F.2d 266, 135 USPQ 442 (CCPA 1962). Such facts include the characteristics and properties of a material or a scientific truism. Some specific examples in which later publications showing factual evidence can be cited include situations where the facts shown in the reference are evidence "that, as of an application 's filing date, undue experimentation would have been required, In re Corneil, 347 F.2d 563, 568, 145 USPQ 702, 705 (CCPA 1965), or that a parameter absent from the claims was or was not critical, In re Rainer, 305 F.2d 505, 507 n.3, 134 USPQ 343, 345 n.3 (CCPA 1962), or that a statement in the specification was inaccurate, In re Marzocchi, 439 F.2d 220, 223 n.4, 169 USPQ 367, 370 n.4 (CCPA 1971), or that the invention was inoperative or lacked utility, In re Langer,

> 503 F.2d 1380, 1391, 183 USPQ 288, 297 (CCPA 1974), or that a claim was indefinite, In re Glass, 492 F.2d 1228,1232 n.6, 181 USPQ 31, 34 n.6 (CCPA 1974), or that characteristics of prior art products were known, In re Wilson, 311 F.2d 266, 135 USPQ 442 (CCPA 1962)." In re Koller, 613 F.2d 819, 823 n.5, 204 USPQ 702, 706 n.5 (CCPA 1980) (quoting In re Hogan, 559 F.2d 595, 605 n.17, 194 USPQ 527, 537 n.17 (CCPA 1977) (emphasis in original)). However, it is impermissible to use a later factual reference to determine whether the application is enabled or described as required under 35 U.S.C. 112, first paragraph. In re Koller, 613 F.2d 819, 823 n. 5, 204 USPQ 702, 706 n.5 (CCPA 1980). References which do not qualify as prior art because they postdate the claimed invention may be relied upon to show the level of ordinary skill in the art at or around the time the invention was made. Ex parte Erlich, 22 USPQ 1463 (Bd. Pat. App. & Inter. 1992).

In the instant case, the Encyclopedia discloses characteristics of the cation exchange resin used by the reference.

Claims 1-3, 6, 9-30, 32-40, 45, 48-50, 55-57, 61, 62 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135; Heikkila '135), in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010), as applied to claims 1-3, 6, 9-29, 33-40, 48-50, 55-57, 61, 62 and 71, in view of Heikkila et al. (US 2002/0153317; cited in the IDS filed 7/28/06; Heikkila '317).

The combined disclosures by Antila et al. and Heikkila '135 are discussed supra.

The combined disclosures do not teach that the fractionization is carried out by nanofiltration (instant claims 30 and 32).

Heikkila '137 discloses that arabinose can be recovered from a mixture by nanofiltration. Disaccharides are removed by the process (section [0103]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the filtration process of Antila by nanofiltration. ^he ordinary artisan would have been motivated to do so because Heikkila '137 teaches that it is effective to remove contaminants as small as disaccharides. The ordinary artisan would have had a reasonable expectation that one could subject a solution containing arabinose to nanofiltration to since Heikkila teaches that the method is effective to remove even the smallest of sugars including disaccharides.

Claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135), in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010), in further view of Tanaka et al. (US 20030040489).

The combined disclosures by Antila and Heikkila et al. are discussed supra.

The combined disclosures not teach that the hydrolysis is carried out by enzymes (instant claim 1).

Tanaka et al. disclose a method for producing L-arabinose (instant claim 71) by treating a natural material containing arabinose, arbinoxylan or arabinogalactan with an enzyme having activity that hydrolysis said sources of arabinose (abstract). The produce thus obtained may be purified by various chromatographic means including ion exchange (section [0038]). The source of the arabinose can be beet pulp (Ex. 2, section [0056]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the hydrolysis of the beet pulp taught by the combined disclosures by enzymes. The ordinary artisan would have been motivated to do so because each method is known to have the same function (hydrolysis of beet pulp to yield L-arabinose). Hence, the substitution of the enzymatic method for the acidic hydrolysis procedure is no more than the predictable use of prior art elements according to their established functions resulting in the simple substitution of one known element for another for a predictable result. The ordinary artisn would have had a reasonable expectation that one could successfully enzymatically hydrolyze beet pulp to L-arabinose because Tanaka et al. teach the successful accomplishment of this objective.

Claims 1-3, 6-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135), in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010), as applied to claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71 in further view of Kramar et al. (CS 181484; CAPLUS abstract only).

The combined disclosures by Antila and Heikkila et al. are discussed supra.

The combined disclosures do not teach that the source of the arabinose-containing material is birch bark (claims 7 and 8).

Kramar et al. disclose that arabinose and xylose can be obtained by the acidic hydrolysis (sulfuric acid) of birch bark.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ birch bark for the beet pulp as the source of arabinose as disclosed by the combined references. The ordinary artisan would have been motivated to do so because it contains arabinose which is obtainable by acidic hydrolysis (as in the method of the combined disclosures). The ordinary artisan would have had a reasonable expectation that one could obtain arabinose from birch bark by acidic hydrolysis since Kramar et al. teach this.

Claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62, 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135), in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010), as applied to claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71, in further view of Ingle et al. (1985) and Dobler et al. (US 4,778,531).

The combined disclosures by Antila et al. and Heikkila et al. are discussed supra.

The combined disclosures not teach the preparation of D-ribose from L-arabinose.

Ingle et al. further teach that rare sugars such a D-ribose can be prepared from L-arabinose (p. 369, left col. third paragraph).

Dobler et al. teaches that D-ribose is prepared from L-arabinose by epimerization of L-arabinose in the presence of a molybdenum catalyst (col. 1, lines 37-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to convert the L-arabinose obtained by the combined references to D-ribose. The ordinary artisan would have been motivated to do so because Ingle teaches that L-arabinose is a source of D-ribose. The ordinary artisan would have had a reasonable expectation that one could epimerize L-arabinose to D-ribose since Dobler et al. teach this process.

Claims 1-3, 6, 9-29, 33-40, 45, 48-50, 55-57, 61, 62 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antila et al. (US 6,506,897; cited in the IDS filed 7/28/09) in view of Heikkila et al. (US 2002012135) in view of evidence from Ullmann's' Encyclopedia of Industrial Chemistry (2008; provided by Applicants in the response of 6/29/2010) in view of Heikkila et al. (WO 03/080872; "Heikkila '872).

The combined disclosures by Antila et al., Heikkila et al. and the Encyclopedia are discussed supra.

The combined disclosures do not teach that the ion exchange resin used to separate the arabinose from other sugars is weakly basic (claims 26 and 27).

Heikkila '872 teach that arabinose can be separated from other monosaccharides by weakly basic anion exchange resins (p. 5, lines 20-30).

It would have been obvious to one of ordinary skill in the art to employ a weakly basic anion exchange resin to separate arabinose from other sugars. The ordinary artisan would have been motivated to do so because each process is known to have the same function, separating arabinose from other monosaccharides. Hence, the

substitution is no more than the predictable use of prior art elements according to their established functions resulting in the simple substitution of one known element for another for a predictable result. The ordinary artisan would have had a reasonable expectation that one could successfully purify arabinose from other monosaccharides on a weakly acidic cation exchange resin since Heikkila '872. teach this.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUSAN HANLEY whose telephone number is (571)272-2508. The examiner can normally be reached on M-F 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on 571-272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Susan Hanley/
Examiner, Art Unit 1651